

REMARKS

Reconsideration of this application is respectfully requested. Claims -42 have been canceled and new claims 43-77 substituted therefore. claims 43-77 are now pending. Entry of this amendment is respectfully requested. This amendment is accompanied by a Request for Continued Examination.

In the Final Office Action, the Examiner has maintained his novelty and obviousness rejections primarily based on US 2,232,388 (Ingalls *et al.*). The Applicant notes that the US Examiner has withdrawn the citation of US 2,651,413 (Daman) as anticipating or rendering unpatentable claims 1 to 26 and 35 to 42.

The pending claims have been replaced with new claims 43 to 77, with new claim 43 having the subject matter of cancelled claims 1, 21, 24 and 27. In other words, claim 43 substantially corresponds to cancelled claim 27. Thus, claim 43 now defines a flotation device including a tank, a feed inlet, an agitator and an aerator. The agitator comprises, *inter alia*, a primary rotor adapted to induce a primary fluid flow and a secondary fluid flow above the primary fluid flow within the tank, and an auxiliary agitation blade disposed for coaxial rotation above the primary rotor to induce axial fluid flow in a downward direction, thereby to supplement the secondary flow induced by the primary rotor. The aerator comprises an air blower and a fluid conduit for directing air from the blower into the primary rotor so as to aerate the slurry.

It is submitted that the invention as now claimed is novel and patentable over the cited prior art. In particular, it is respectfully submitted that Ingalls fail to disclose or teach the claimed invention, especially the combined features of the agitator and aerator as now defined by the claims.

The Examiner has conceded in his Final Office Action that cancelled claim 27, which substantially corresponds to claim 43, is novel over Ingalls. In particular, it is submitted that Ingalls fails to disclose a fluid conduit for directing air into the primary rotor so as to aerate the slurry.

Ingalls discloses a fluid conduit for introducing air into the slurry in the form of a hollow spindle 58 and apertures 61 arranged adjacent the blades of the upper impeller 59. However, the conduit is blocked by a plug 62 before reaching the lower primary impeller 57 – see column 3, lines 56 to 61. The Examiner is particularly referred to the passage at column 3, lines 59 to 61 which states that the conduit formed in the spindle 58 is closed at its lower end by a plug 62, “*....whereby air is entirely induced into the pulp through the opening 61*” (emphasis added). That is, air is not introduced into the lower impeller 57, unlike the present invention. In Ingalls, air is dispersed into the slurry by the upper impeller 59, whereas in the present invention, air is dispersed into the slurry through the lower primary rotor 6 adjacent the bottom of the tank. Thus, it is submitted that Ingalls fails to anticipate the invention as now claimed.

It is also submitted that claim 43 is patentable over the cited prior art. The Applicant notes that the Examiner rejected claim 27, which corresponds generally to new claim 43, based on a combination of Ingalls with Daman. In particular, the Examiner has asserted at item 8 of the Final Office Action that the use of a primary impeller attached to a source of air in a double mounted impeller flotation cell is disclosed in Daman and therefore it would have been obvious to one of ordinary skill in the art to operate the flotation cell of Ingalls in the same way. However, it is submitted that to operate Ingalls in the manner as disclosed in Daman and as asserted by the Examiner would be contrary to the explicit teaching of Ingalls. Moreover, there would be no other motivation to do so. It is therefore beyond the ability of one ordinary skilled in the art to modify the operation of Ingalls to arrive at the claimed invention.

As noted above, Ingalls requires that air is introduced into the pulp solely through the apertures 61 formed adjacent the blades of the upper impeller 59 and not through the lower impeller 57. This is contrary to the claimed invention, where there is a fluid conduit for directing air into the primary (lower) rotor. Thus, it is submitted that Ingalls explicitly teaches away from the claimed invention.

In respect of Daman, the Applicant notes that the Examiner has relied on Figure 6 to support his rejection. However, it is submitted that the embodiment of Figure 6 is intended to replace the upper impeller 31 and not the lower impeller 30 – see column 8, lines 74 to column 9, line 2. Thus, it is submitted that Figure 6 of Daman does not in fact disclose or teach directing air

toward a primary impeller disposed below an auxiliary agitation blade, as in the claimed invention.

Furthermore, Daman does not disclose the lower impeller 30 generating a secondary fluid flow that could be supplemented by the downward fluid flow created by the upper impeller 31, as discussed in greater detail in the Applicant's submissions in reply to the first Office Action. It is therefore submitted that even in combination, Ingalls and Daman fail to disclose or teach the feature of an auxiliary agitation blade which induces axial fluid flow in a downward direction so as to supplement a secondary flow induced by the primary rotor.

Not only does Ingalls teach away from the invention, it is also submitted that the disclosures of Ingalls and Daman are in conflict for two primary reasons. Firstly, Ingalls requires that air is dispersed solely through the upper impeller 59, as described at column 3, lines 59 to 61, whereas in Daman, it requires that air is directed towards the primary rotor in the form of lower impeller 30 through conduit 60 at the bottom of the tank, at the precise location of the bottom opening 56 for introducing ore pulp into the tank of Ingalls. It is therefore submitted that one skilled in the art, when reading Ingalls in conjunction with Daman, would receive conflicting directions as to the construction of the lower impeller and the manner in which air is introduced in the slurry, either solely through the upper impeller 59 as taught by Ingalls or through a combination of the upper and lower impellers as taught by Daman.

Secondly, Daman teaches that the lower impeller 30 is effectively isolated from the upper impeller 31 by means of an enclosure 40 over the top of the lower impeller 30 in close proximity to its blades, including a flanged or flared hood portion 41 overhanging the lower impeller 30. In effect, the lower impeller 30 is completely separated from the upper impeller 31, as shown in Figures 1 to 4. It is therefore submitted that one skilled in the art, when reading Ingalls in conjunction with Daman, would also receive conflicting directions as to the configuration of the upper and lower impellers, either isolating the lower impeller from the upper impeller as taught by Daman or allowing the flows of the upper and lower impeller to mix as taught by Ingalls.

It is therefore submitted that to arrive at the claimed invention, one skilled in the art would need to substantially modify the structure of Ingalls, and in particular, would need to

selectively ignore Ingalls' instruction that air is to be entirely induced into the slurry through the upper impeller 59 and Daman's instruction to add an enclosure for the lower impeller.

It is also submitted that to modify Ingalls so as to remove the plug 62 and permit air to be directed into the lower impeller 57 would defeat the stated purposes of the upper impeller 59 and lower impeller 57. In the embodiment of Figures 8 to 10, the lower impeller 57 acts as an auxiliary agitator with the functional purpose of creating a suction effect to pump fresh ore slurry feed into the flotation chamber. The upper impeller 59 is a floating agitator with a self aspirating property and its purpose is to mix air into the slurry. Modifying the lower impeller 57 to aerate the slurry would render the upper impeller 59 redundant and, it is submitted, adversely affect the ability of the lower impeller 57 to draw ore pulp from the bottom opening 56.

Therefore, it is submitted that the claimed invention is patentable over a combination of Ingalls and Daman. It is also submitted that none of the remaining prior art references discloses the features of a primary rotor adapted to induce a primary fluid flow and a secondary fluid flow above the primary fluid flow within the tank, an auxiliary agitation blade to induce axial fluid flow in a downward direction, thereby to supplement the secondary flow induced by the primary rotor, and a fluid conduit for directing air from the blower into the primary rotor so as to aerate the slurry. Therefore, these prior art documents also fail to anticipate or render unpatentable the claimed invention.

As all the remaining claims depend directly or indirectly on claim 43, it is submitted that these claims are also patentable over the cited prior art. In particular, it is submitted that new claim 44 is novel over Ingalls as it specifies that the auxiliary agitation blade induces substantially only axial flow in a downward direction, whereas in Ingalls the upper impeller 59 generates both axial and radial flow to disperse air into the slurry. It is submitted that the additional radial flow generated by the upper impeller 59 in Ingalls creates different flow mechanics in the tank compared to the flow mechanics created in the present invention. In Ingalls, ore pulp is introduced into the tank from a central bottom opening 56 and is drawn up into the tank by a centrifugal pumping effect produced by the lower impeller 57. At the same time, a downward axial and radial flow of air is dispersed by the upper impeller 59. Thus, the slurry dispersed radially and upwardly by the lower impeller 57 comes into contact with the downward and radial flow from the upper impeller 59. It is submitted that the Ingalls impeller

arrangement thus results in two fluid flows in opposite directions coming into contact to aerate the slurry.

In contrast, in the claimed invention, the auxiliary agitation blade 12 produces a supplementary axial downward flow that complements the direction of the secondary flow generated by the primary rotor 6, as illustrated in Figure 4 of the specification, and not in an opposite direction. Therefore, it is submitted that the Ingalls impeller 59 would produce an entirely different effect to that created by the auxiliary agitation blade of the claimed invention, and hence fails to anticipate claim 44.

Moreover, it is submitted that Ingalls, individually or in combination of any other cited prior art document, would fail to render claim 44 unpatentable because Ingalls teaches away from the claimed invention by requiring both a radial and axial flow to be created by the upper impeller, whereas in the claimed invention, the auxiliary agitation blade induces substantially only axial flow in a downward direction, to the exclusion of any substantial radial flow component.

On this basis, it is submitted that the application is in order for allowance and favorable reconsideration is requested.

Respectfully submitted,

  
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